Regeneration on Linear Developments Subject to Wildfires in a Zone of Continuous Permafrost

Non-technical Summary

Seismic lines are a persistent feature in the North American boreal forest. Historically, methods of clearing seismic lines involved bulldozing linear, 6-8 m wide corridors through the landscape to allow for travel of geophysical crews and equipment. As a result, seismic lines have left a visible mark on the landscape. There is interest among First Nation and other governments, industry groups and NGO's in monitoring the long term response of vegetation to linear disturbances in order to better understand the ecological impacts of these disturbances. In order to gain a better understanding of re-vegetation on linear disturbances, it is also important to consider the influence of fire in this regeneration process. In northern boreal forests, fire is a recurring and influential factor in processes of vegetation regeneration and succession. Many vegetation species have been shown to regenerate rapidly following fire. Others, such as black spruce, regenerate after a delay of several to many years. Research into how vegetation in linear disturbances responds to wildfire contributes to our overall understanding of re-vegetation in these disturbances, and may also aid the development of Best Management Practices for seismic exploration.

The Study

The purpose of this study was to investigate the influence of fire on vegetation regeneration in several types of linear disturbances, including 30-year-old seismic lines, a one-year-old winter road leading to a test well site, and a portion of the same winter road constructed on a 30-year-old seismic line. The study took place in a black spruce-dominated forest in the zone of continuous permafrost in the area of Eagle Plains, YT. The study was conducted in the first year following a fire that burned the newly-constructed winter road and surrounding forest. The field component of the research included documenting all of the vegetation species present, and the abundance of these species, in burned and unburned linear disturbances and adjacent forests. Comparisons were made between vegetation within each type of linear disturbance and the adjacent forest, as well as between burned and unburned areas.

Results

Overall, the vegetation was highly uniform throughout the study area and among the different disturbance types. Fire had the greatest effect on vegetation, with a greater number of species present and more abundant vegetation in unburned sites. In burned sites, the dominant plant species found in the black spruce forest are re-generating rapidly across all disturbance types, likely from plants and below-ground sources that were not completely burned. This initial response suggests that vegetation characteristic of pre-fire conditions is likely to re-establish in the burned linear disturbances.

Of the three types of burned linear disturbances studied, the combined disturbance of the new winter road constructed on an existing seismic line had the greatest impact on vegetation regeneration in the first post-fire growing season. Vegetation was more abundant and a greater number of species were present in this combined disturbance type. It is possible that this disturbance did not burn as severely as

the adjacent forest as a result of having a lighter fuel load, allowing for immediate re-growth from preserved plants.

Because the study was completed in the first post-fire growing season, it was not possible to assess regeneration of black spruce, an important structural species that is not reported to begin re-establishing until several years after a burn. Similarly, it was also not possible to assess lichen regeneration, an important element of vegetation succession in black spruce forest that also re-establishes later than the first post-fire growing season. Continued monitoring will be required to understand the longer term response of vegetation to fire in linear disturbances.